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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/607,238	06/25/2003	Naoya Hasegawa	9281/4579	4781

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EXAMINER

BERNATZ, KEVIN M

ART UNIT	PAPER NUMBER
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1773

DATE MAILED: 02/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/607,238

Applicant(s)

HASEGAWA ET AL.

Examiner

Kevin M Bernatz

Art Unit

1773

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30,34,35 and 39-42 is/are pending in the application.
- 4a) Of the above claim(s) 23,31-33 and 39-42 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-22,24-30,34,35 and 39-42 is/are rejected.
- 7) ☒ Claim(s) 5 and 6 is/are objected to.
- 8) ☒ Claim(s) 1-30,34,35 and 39-42 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>6/03; 11/03; 5/04</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Response to Amendment

1. Cancellation of claims 31 – 33 and 36 - 38, filed on December 16, 2004, have been entered in the above-identified application.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Examiner's Comments

3. The Examiner notes that claim 17 is confusing because a dependent claim must necessarily include all the limitations of the claims from which it depends from (in this case, claims 13, 15 and 16). The reason that the Examiner deems that claim 17 is confusing because claim 16 requires that that metal layer be a noble metal, yet claim 17 recites that "instead of a noble metal layer", a Cu layer is used. While the scope of the claim is understandable in terms of 35 U.S.C. 112 2nd Paragraph, the unusual situation of art reading on dependent claim 17, but *not* intervening claims 15 and 16 could result. The Examiner strongly encourages applicants to use a Markush group of {noble metal or copper} to refer to the metal material layer in claims 15 and 16, such as applicants have done in claims 39 and 40.

Election/Restrictions

4. The Examiner notes that applicants have cancelled all the claims of Group II, hence rendering the restriction between Groups I and II moot. As such, the restriction between Groups I and II is withdrawn.

5. Applicant's election of Species A in the reply filed on December 16, 2004 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). The restriction is still deemed pr

Double Patenting

6. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

7. Claims 13, 18 – 22 and 34 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 - 20 of copending Application No. 10/103,358 (see U.S. Patent No. 6,707,649 B2). Although the conflicting claims are not identical, they are not patentably distinct from each other

because App. '358 disclose the current limiting layer meeting applicants' claimed structure is "provide on at least one of upper and lower surfaces of the free magnetic layer" (*claim 1*).

Regarding claims 19 – 21, the Examiner deems that "grooves" are obvious variations of "holes" and that one of ordinary skill in the art possesses the knowledge that changing the shape of conductive region would still produce a MR device operating in an identical fashion.

Claim Objections

8. Claims 5 and 6 are objected to because of the following informalities: the numbers "10" and "15" should be deleted from claims 5 and 6, respectively. Appropriate correction is required.

Claim Rejections - 35 USC § 112

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. Claim 39 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 39 recites the limitation "the first magnetic layer" in lines 3 – 4 and "step (a)" in line 4. There is insufficient antecedent basis for this limitation in the claim, since the base claim does not recite a "first magnetic layer" or a "step (a)".

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

(f) he did not himself invent the subject matter sought to be patented.

12. Claims 1, 2, 7 – 22, 24, 26 – 30, 34, 35, 39 and 40 are rejected under 35

U.S.C. 102(a), (b) and/or (e) as being anticipated by Kamiguchi et al. (U.S. Patent No. 6,495,275 B2).

Regarding claims 1, 2, 13, 14, 24, 30, 34 and 35, applicants' claimed structures are shown in Table 1 below.

Table 1: Illustration of claimed element structure

<i>Claims 1 and 24</i>	<i>Claims 2, 30 and 35</i>	<i>Claims 13 and 34</i>	<i>Claim 14</i>
Upper elec.	Upper elec.	Upper elec.	Upper AFM
Free mag. 2	Upper AFM	Free mag.	Upper Pinned mag.
Cur. Lim. Layer	Upper Pinned mag.	Cur. Lim. Layer	Upper Non-mag.
Free mag. 1	Upper Non-mag.	Non-mag.	Cur. Lim. Layer
Non-mag.	Free mag. 2	Pinned mag.	Free
Pinned mag.	Cur. Lim. Layer	AFM	Lower Non-mag.
AFM	Free mag. 1	Lower elec.	Lower Pinned mag.
Lower elec.	Lower Non-mag.		Lower AFM
	Lower Pinned mag.		
	Lower AFM		
	Lower elec.		

Kamiguchi et al. disclose the general structures, excluding the current limiting layers, as exemplified by Figure 41 (*element 11 = free magnetic layer; element 12 = Non-mag. spacers; element 13 = Pinned magnetic layers; element 14 = AFM layers; and elements 15 and 19 = upper and lower “electrodes”*). The Examiner notes that Kamiguchi et al. further teach that a “K-layer” comprising a mixture of conductive magnetic metal particles and an oxide or nitride matrix can be inserted into a synthetic free layer structure (*col. 13, line 8 bridging col. 14, line 6: free layer of CoFe/K-*

layer/CoFe). The Examiner notes that using such a free layer as element 11 in Figure 41 results in embodiments reading on all the disclosed structures above since applicants' claims are open to additional layers being present in the element. The Examiner further notes that Kamiguchi et al. disclose the current meeting applicants' claimed limitation (*col. 28, lines 27 – 43*). Finally, the Examiner notes that Kamiguchi et al. provides explicit teaching that the mixed oxide + metal layers need not be continuous (*col. 32, line 60 bridging col. 33, line 9*).

Regarding claim 7, Kamiguchi et al. disclose using magnetic films with anti-parallel magnetization directions (*col. 13, line 50 bridging col. 14, line 6 and Examples*).

Regarding claims 8 – 11 and 26 - 29, the Examiner notes that Kamiguchi et al. disclose that the magnetic layers can be the same or different from each other, in both materials and thickness values (*col. 14, lines 1 – 56 and Examples*) and, therefore, Kamiguchi et al. implicitly teach the claimed limitations.

Regarding claims 12, 15 – 17 and 39 - 41, Kamiguchi et al. disclose non-magnetic noble metal and/or copper layers meeting applicants' claimed limitations (*col. 20, lines 24 – 31 and Examples, such as Example 17*).

Regarding the limitation(s) "holes" and "grooves" in claims 18 - 22, the Examiner has given the term(s) the broadest reasonable interpretation(s) consistent with the written description in applicants' specification as it would be interpreted by one of ordinary skill in the art. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Donaldson Co., Inc.*, 16 F.3d 1190, 1192-95, 29 USPQ2d 1845, 1848-50 (Fed. Cir. 1994). See MPEP 2111. Specifically, a "hole" is deemed to be a

substantially circular opening while a "groove" is deemed to be any opening with one axis longer than the other. As such, the Examiner deems that the partially oxidized layers capable of possessing pinholes, etc. as taught by Kamiguchi et al. would inherently possess a combination of "holes" and "grooves" given the random nature by which the "pinholes" and island-like structures would develop.

13. Claims 1, 5 – 7, 9, 11, 13, 15, 16, 18, 22, 24, 25, 27, 29, 34 and 39 – 41 are rejected under 35 U.S.C. 102(a) and/or (e) as being anticipated by Hasegawa et al. (U.S. Patent App. No. 2002/0135956 A1); – **and** –

14. Claims 1, 5 – 7, 9, 11, 13, 15, 16, 18, 22, 24, 25, 27, 29, 34 and 39 – 41 are rejected under 35 U.S.C. 102(a) as being anticipated by Hasegawa et al. (JP 2003/008108 A). See Derwent Abstract Translation and US Patent App. No. '956 A1 above, which is the English Language equivalent of JP '108 A; – **and** –

15. Claims 1, 5 – 7, 9, 11, 13, 15, 16, 18, 22, 24, 25, 27, 29, 34 and 39 – 41 are rejected under 35 U.S.C. 102(f) because the applicant did not invent the claimed subject matter, since Hasegawa et al. has a common assignee, but a different inventive entity than the present application.

The applied references have a common assignee and inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this

application and is thus not the invention “by another,” or by an appropriate showing under 37 CFR 1.131.

For the purpose of the above rejection, the Examiner will make reference to Table 1 above as describing applicants’ claimed structure. Table 2 illustrates two structures disclosed by Hasegawa et al. which read on the claimed structural limitations.

Table 2: Embodiments of Hasegawa et al.

<i>Emb. A</i>	<i>Emb. B</i>
Electrode	Electrode
Mag. bias layer	Free mag. layer
Cur. lim. layer	AF coupling layer
Free mag. layer	Free mag. layer
AF coupling layer	Cur. lim. layer
Free mag. layer	Non-mag. spacer
Non-mag. spacer	Pinned mag. layer
Pinned mag. layer	AFM layer
AFM layer	Electrode
Electrode	

The Examiner notes that Embodiment A is described in Figure 4 and Paragraphs 0166 – 0173, while Embodiment B is described in Figure 3 and Paragraphs 0166 – 0173 and 0189. The boxed region is the “synthetic free” layer described in the cited Paragraphs above.

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Embodiment A reads on claims 1, 5 – 7, 9, 11, 24, 25, 27 and 29 with the inclusion of the magnetic bias layer as part of the claimed “free magnetic layer compris[ing] a plurality of magnetic layers”. The Examiner notes that the two free magnetic layers in the synthetic free structure will possess antiparallel magnetization directions, so one of the layers will inherently be ferromagnetically coupled with the magnetic bias layer (upper Free mag. layer) and one will inherently be antiferromagnetically coupled to the magnetic bias layer (lower Free mag. layer).

Regarding claims 9, 11, 27 and 29, given that the magnetic bias layer and synthetic free magnetic layer is composed of different alloys and has different functions, the Examiner deems that one of ordinary skill would readily appreciate that these films would not possess the same magnetic moment per unit area, nor the same thickness absent an explicit teaching otherwise.

Embodiment B reads on claims 13, 15, 16, 18, 22, 34 and 39 – 41, given that the deposition order could start from the top of Table (so that the current limiting layer is deposited after the noble metal containing AF coupling layer) or from the bottom of the Table (so that the noble metal containing layer is deposited on the current limiting layer before the upper “free magnetic layer”).

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

17. Claims 17 and 19 – 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasegawa et al. as applied above in Paragraphs 0013 – 0015.

Hasegawa et al. is relied upon as described above.

Regarding claim 17, Hasegawa et al. fail to disclose using Cu instead of Ru as the AP coupling layer.

However, the Examiner deems that Ru and Cu are known equivalents in terms of non-magnetic metals capable of inducing AP coupling between adjacent magnetic films.

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. In the instant case, Ru and Cu are equivalents in the field of AP coupling films. *In re Fount* 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *Graver Tank & Mfg. Co. Inc. v. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

Regarding the limitation(s) “holes” and “grooves” in claims 19 - 21, the Examiner has given the term(s) the broadest reasonable interpretation(s) consistent with the written description in applicants’ specification as it would be interpreted by one of ordinary skill in the art. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Donaldson Co., Inc.*, 16 F.3d 1190, 1192-95, 29 USPQ2d 1845,

1848-50 (Fed. Cir. 1994). See MPEP 2111. Specifically, a "hole" is deemed to be a substantially circular opening while a "groove" is deemed to be any opening with one axis longer than the other. As such, the Examiner deems that one of ordinary skill in the art would readily appreciate the functional equivalent between using a layer comprising "holes" versus one comprising "grooves" or a combination thereof, since the same identical function of the layer would still be achieved.

18. Claims 3, 4 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamiguchi et al. as applied above, and further in view of Mack et al. (U.S. Patent No. 6,462,919 B1).

Kamiguchi et al. is relied upon as described above.

Kamiguchi et al. fail to disclose bias elements meeting applicants' claimed limitations.

However, Mack et al. teach that it is old in the art to provide bias elements meeting applicants' claimed limitations in order to bias the edges of the free magnetic layer to reduce the generation of noise via domain wall movement (*Figure 6A; col. 2, lines 15 – 24 and lines 48 – 56; col. 4, line 22 bridging col. 5, line 11; and col. 8, lines 34 – 64*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Kamiguchi et al. to use bias elements meeting applicants' claimed limitations as taught by Mack et al. in order to bias the

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edges of the free magnetic layer to reduce the generation of noise via domain wall movement.

19. Claims 5, 6 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamiguchi et al. as applied above, and further in view of Kishi et al. (U.S. Patent App. No. 2002/0191451 A1).

Kamiguchi et al. is relied upon as described above.

Kamiguchi et al. fail to disclose the plurality of magnetic layers making up the free magnetic layer being ferromagnetically coupled to each other (i.e. the magnetizations being parallel to each other).

However, the Examiner deems that multilayered free layers that are AP coupled and multilayered free layers that are FM coupled are known equivalents in the field of multilayered free layers for use in MR sensing elements, as taught by Kishi et al.

(Abstract).

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. In the instant case, AP coupling and FM coupling are equivalents in the field of multilayered free layers.

Conclusion

20. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following references all disclose metal + non-metal layers similar to Kamiguchi et al.'s "K-layer": Sugawara (U.S. Patent No. 6,828,039 B2), Yuasa

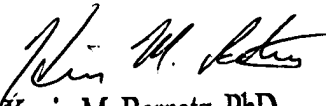
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et al. (U.S. Patent App. No. 2004/0246634 A1), Yoshikawa et al. (U.S. Patent App. No. 2002/0135954 A1), Gill (U.S. Patent App. No. 2003/0026049 A1), Seyama et al. (U.S. Patent App. No. 2002/0097538 A1) and Hoshiya et al. (U.S. Patent App. No. 2003/0206384 A1). Fujiwara et al. (U.S. Patent App. No. 2002/0054461 A1) and Sugawara (U.S. Patent App. No. 2004/0052008 A1) both teach conductive + insulating layers as "spacer" layers between the pinned and free magnetic layers in a MR element.

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M Bernatz whose telephone number is (571) 272-1505. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Deborah Jones can be reached on (571) 272-1535. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Kevin M. Bernatz, PhD
Primary Examiner

KMB
February 4, 2005